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The new International Atlas of Clouds and of States of the Sky

Much cloud has passed across the sky since the appearance of the first International Atlas of Clouds in 1895. That work, prepared by Hildebrandsson, Riggenbach, and Teisserenc de Bort, provided a systematic classification—based partly upon the form and partly upon the height of the cloud—into which all the observed forms of cloud might be fitted. How effective this classification has proved during the thirty-six years since its introduction is best shown by the fact that, in the new International Atlas of 1931, the same general groups and sub-groups of cloud-forms are recognized.

It was of course obvious from the first that observers would experience difficulty in deciding how to deal with clouds which departed from the really typical form, and this, together with the fact that certain definite variations of the typical form recurred more or less frequently, acted as an incentive to several workers to develop classifications which were much more elaborate than the international one. When, however, in response to a growing demand, the second edition of the International Atlas appeared in 1910, the original classification remained, with the addition of a note upon the lenticular form sometimes assumed by the intermediate clouds, and with a few additional and new illustrations in the Plates.

The development of aviation during the years of the war and

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those immediately succeeding it stimulated powerfully the study of cloud formation and development, and many books and atlases dealing with clouds were published in the various countries. In 1922 the International Commission for the Study of Clouds began the preparation of an ambitious new atlas, of which the volume under review is an abridged summary intended specially for the use of observers.

Let it be said at once that this new "International Atlas of Clouds and of States of the Sky" is a worthy consummation of the many years' labour of the Commission, and a remarkable advance upon the earlier atlas. The first part of the text deals with the classification of the individual cloud forms and enumerates practically the same groups as did the original atlas, but gives much more complete descriptive notes of each cloud type and its variations. Following the first part is a second one explaining the "cloud-code" now used internationally by the various official meteorological services. This cloud-code is largely the outcome of that important work, "Les systèmes nuageux," by MM. Schereschewsky and Wehrlé, and enables the observer not only to indicate the individual cloud forms present, but also to describe their general arrangement and organization in the sky, and to indicate the particular stage of their evolution. In practice this code has proved a marked advance upon the older method of merely enumerating the individual cloud forms, though even yet skies are occasionally met with which are not easily assignable to a particular sub-division except by a skilled observer or by a close watch being kept upon the development of the clouds over a period of time. These various "states of the sky," as they are called, can generally be associated with certain definite areas within or surrounding a typical depression.

With regard to the general classification of the clouds, the only type which has been subjected to radical change is nimbus. In the earlier atlas nimbus was regarded as a separate type associated with rain, but in the new atlas precipitation may fall from alto-stratus precipitans or from nimbo-stratus, while the term nimbus is reserved for a ragged scud cloud which forms below the nimbo-stratus. There is still some divergence of opinion regarding this type of cloud, and in the cloud-code the term nimbus is meantime reserved for the broken or ragged low cloud of bad weather.

A word now as to the plates accompanying the text. The atlas of 1910 contained 29 illustrations on 14 plates, but these differed only slightly from those of the 1895 edition. At that time photographic plates had the limitation of being sensitive only to the blue-violet and ultra-violet rays of the spectrum, and it was exceedingly difficult to obtain sufficient contrast between blue sky and white cloud in the case of the higher cirriform clouds. For some cloud types, owing to the lack of suitable photographs,

recourse had to be made to water-colour sketches to provide the necessary illustrations.

In the early years of the present century the technique of cloud photography was greatly improved by the ingenious use of a polarising black mirror by A. W. Clayden, and the writer is still inclined to regard Clayden's picture of a waved alto-cumulus as one of the finest ever produced. But with the advent of the panchromatic plate, sensitive to all the spectral colours, and by the employment of yellow, orange, or red filters to give any desired degree of contrast, cloud photographs to-day are far superior to their antecedents of 36 years ago, and the plates in the new atlas demonstrate this very clearly. There are 41 plates containing 41 figures of cloud types, most of which are printed in two colours, blue and grey, in order to achieve as realistic an appearance as possible. Accompanying each plate there is a diagrammatic outline in black and white, and a descriptive note which explains the cloud details in a very lucid manner. The figures have been chosen so as to be as typical examples as possible, and the wide and universal range of their authorship testifies to the assiduousness of the Committee in their selection.

As compared with those in the earlier atlas the photographs are superior from both the scientific and pictorial points of view, and it will be noticed that the majority of them have been taken within the last decade or so. Nevertheless, two outstanding photographs, Plates 23 and 27, were taken at Potsdam as early as 1900. In the writer's opinion the two finest in the set are Plate 36, of tufted cirrus, by Capt. Cave, who has kindly supplied a copy for reproduction as the frontispiece for this number of the magazine, and Plate 3, of turbulent cumulus, from the Office National Météorologique de Paris; the former in particular being a perfect rendering of the delicacy of cirrus structure. Mention should also be made of the very interesting Plate 8, by the Fundació Concepció Rabell of Barcelona, showing by six consecutive photographs the development of bands of strato-cumulus from cumulo-nimbus.

If a note of criticism should be sounded upon so beautiful and valuable a collection of photographs it seems to the writer that Plate 33, representing delicate cirrus, is not so convincing as it might be, but that may be accounted for by its early date—1898. Then again, Plate 7, produced in colours, is certainly very beautiful to look at, but is it quite correct in a scientific work for red and orange colours to appear on the clouds and in the sky while the sun is obviously still 5 to 10 degrees above the horizon?

There are a few obvious printer's errors in the text, and in the second line of the text accompanying Plate 14, "corrugated sheet of cumulo-nimbus" should of course read "corrugated sheet of strato-cumulus."

Such a sumptuous volume has naturally cost a great deal to produce, and it is thanks only to the generosity of M. Rafel

Patxot of Barcelona that the new atlas is obtainable for the relatively very low cost of 14s. 6d. post free.* No meteorologist or person interested in meteorology or clouds should be without it.

G. AUBOURNE CLARKE.

A Katabatic Wind at Heliopolis, Egypt

In the article, "Pressure, temperature and wind variations Heliopolis associated with the warm and cold sectors of a depression," published in the *Meteorological Magazine* for April, 1928, Mr. Durward states "this cooler air lay over the cultivated area around the Nile where the night temperature would naturally be lower." It has been suggested that the use of the word "naturally" may be a little out of place, for it is probably true to say that at first sight an open dry desert site might be expected to record lower minimum temperatures than a site in a cultivated area. Two quotations may be made:—

TABLE I.—NORMALS OF MINIMUM TEMPERATURE IN THE SCREEN.

	Heliopolis (1908-1920) (old site) °C	Giza (1908-1920) °C	Heliopolis-Giza °C
January	7·5	5·5	2·0
February	8·3	6·3	2·0
March	10·9	8·3	2·6
April	13·7	11·5	2·2
May	16·7	14·4	2·3
June	19·4	17·5	1·9
July	21·0	19·4	1·6
August	21·4	19·8	1·6
September	19·4	17·7	1·7
October	17·1	15·7	1·4
November	13·5	11·9	1·6
December	9·4	7·7	1·7
Year	14·9°C	13·0°C	1·9°C

(1) "The Climate of the Continents," Kendrew, p. 25. "But the clear dry air also favours rapid loss of heat from the bare ground after sunset and the cool nights (in the Sahara) are delightfully refreshing."

(2) "Meteorological Atlas of Egypt," plate 9. "To such an extent does the desert lose heat by nocturnal radiation that the night temperature in January on the Mediterranean coast of Egypt is higher than that of all inland stations north of latitude 19°N."

*A limited number of copies at this price is available at the Royal Meteorological Society, 49, Cromwell Road, London S.W.7.

There can be little doubt but that on calm clear nights the desert commences to cool more rapidly than the Delta region. It is, however, equally apparent from statistics that the actual minima (both screen and ground) registered at Heliopolis, which is just within the desert, are decidedly higher than those registered at non-desert stations. Table I shows normal monthly minimum temperatures at Heliopolis and Giza, a suburb of Cairo on the west bank of the Nile. The level of Giza is 21m. lower than Heliopolis.

The lower readings obtained at Giza and other stations near the Nile in and around Cairo may be ascribed in part to lighter winds in the valley as opposed to the more open desert, but probably chiefly to a drainage effect, the chilled air subsiding during the clear nights from the Mokattam Hills, which rise to a height of over 200 metres within 10Km. east-south-east of Cairo.

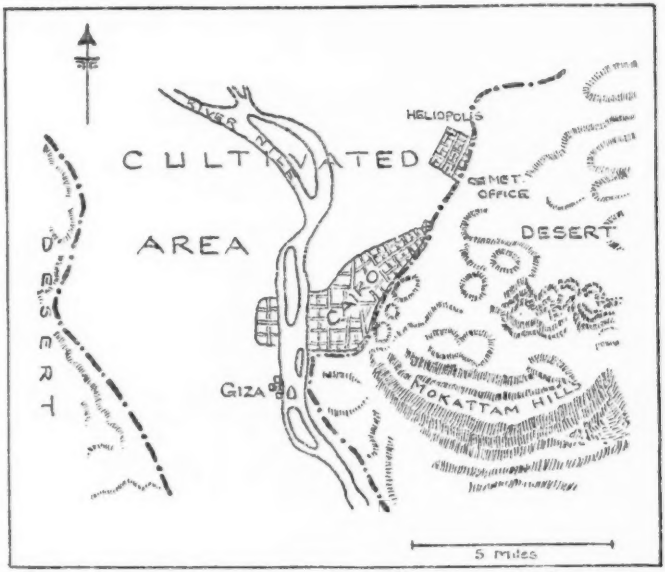

FIG. 1. SKETCH MAP SHOWING POSITION OF METEOROLOGICAL OFFICE AT HELIOPOLIS IN RELATION TO THE DESERT AND CULTIVATED AREAS.

The position of the present meteorological station at Heliopolis is shown in the sketch map (fig. 1). It is definitely within the desert region but near enough to the non-desert region to be influenced by both. On many occasions a prevailing northerly

wind at night (this is to some extent, in the early part of the night, a sea breeze which has travelled over 100 miles from the Egyptian coast) is interrupted suddenly and a breeze of about 10-15m.p.h. sets in from a south-easterly point. This breeze has come over open desert and from its low factor of gustiness is easily identified as a katabatic wind. Its characteristics are almost identical with the wind, described by Newnham in the *Meteorological Office Professional Notes* No. 2, which occurs at Benson, Oxon. It descends a matter of 200 metres in 14Km., its arrival at Heliopolis being marked by a rise of temperature of 2° to 3°F. on the average. Some recent typical anemograms and thermograms which show the effect are reproduced in fig. 2. Hygrograms are not reproduced, but the drop in relative humidity which occurs with the setting in of the katabatic wind amounts to 20 per cent. on many occasions.

The ground to the south-east of Heliopolis rises about 1 in 50, whilst the fall to north-west is only about 1 in 150, so that the rate of flow of air from the higher desert after passing Heliopolis is probably, at no great distance away, reduced so much that the thermal cooling by loss of heat to the slope is greater than the dynamical warming (*see* Shaw's "Manual of Meteorology," Vol. IV, p. 227).

The katabatic breeze is not often experienced for more than 1 to 3 hours. Frequently it continues until about 1½ hours after sunrise, by which time the desert has become rapidly warmed and a reversal of wind direction takes place, the normal march of diurnal temperature being interrupted by a fall of 2-3°F. (D in fig. 2.)

Three cases seem to arise :—

(1) It is probable that the dynamically warmed descending air generally starts to be lifted from the surface at a point a short distance north-west of Heliopolis and passes over the cultivated area at a height varying up to some hundreds of feet, accentuating the normal early morning inversion, the existence of which, over Cairo, is made apparent on most mornings by smoke traces from factory chimneys and by a well-marked haze layer.

(2) Cases also occur where the desert wind seems to be lifted above the surface before reaching Heliopolis. For instance, a pilot balloon ascent made at 4h. G.M.T. on August 12th, 1931, at Heliopolis gave the following results :—

	Wind.
0-1,000ft.	323° 5m.p.h.
1,000-1,500ft.	125° 2m.p.h.
1,500-2,500ft.	23° 6m.p.h.

In association with the gliding surface thus formed, low cloud and later fog occurred from 4h. 10m. to 5h. 15m. G.M.T. The surface wind throughout was NW. 2-7m.p.h. from 3h. 30m. to 6h. G.M.T.

(3) In certain circumstances it would appear that the point where the lifting starts may be shifted repeatedly in the immediate neighbourhood of Heliopolis so that the meteorological station comes under the influence of different air masses several

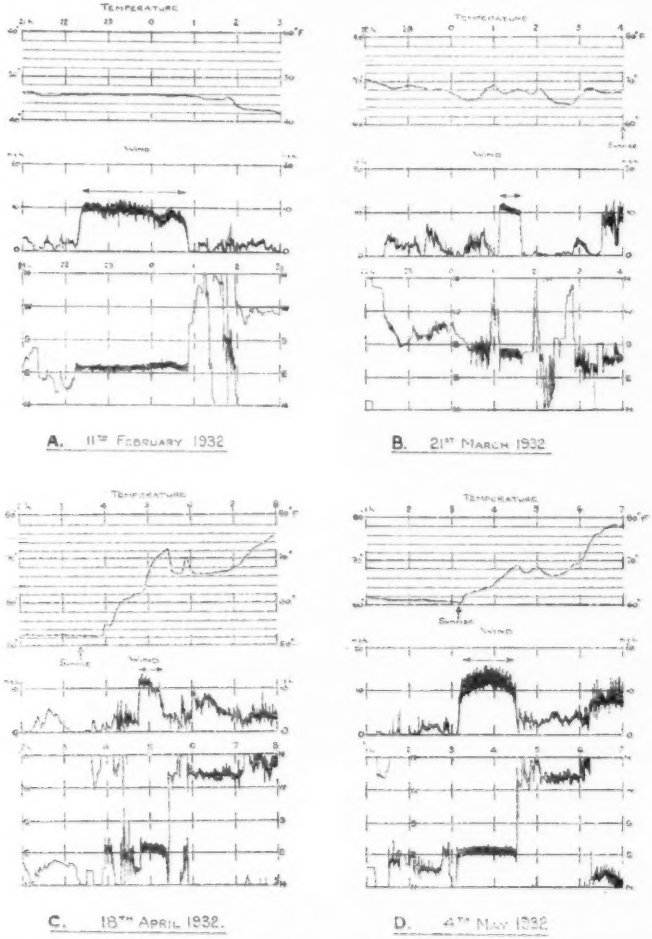

FIG. 2. WIND AND TEMPERATURE RECORDS SHOWING KATABATIC WIND EFFECTS.

times in the early morning; the drop in temperature which results from the cessation of the katabatic wind may amount to as much as 5°F. Illustrations of this occurred an March 21st and April 18th, 1932; autographic records for these dates are reproduced in fig. 2 (B and C).

In conclusion, it may be remarked that in Table I the differences Heliopolis-Giza are greatest in those months when the normal northerly gradient is most frequently disturbed by Mediterranean depressions. The probable reason for this is that during the remaining months the katabatic wind at Heliopolis is able to assert itself less frequently.

Acknowledgements are due to Mr. Durward for some suggestions which have been incorporated in this note.

C. V. OCKENDEN.

Meteorological Office War Memorial

At the end of the Great War there was placed in the Library of the Meteorological Office, South Kensington, a temporary memorial to the four members of the staff who lost their lives during the hostilities. This temporary memorial has now been replaced by a bronze plaque bearing the following inscription in white lettering:—

METEOROLOGICAL OFFICE

ROLL OF HONOUR

GREAT WAR

1914-18

G. J. BARKER	LONDON REGT.
N. C. BRADNOCK	LONDON REGT.
W. B. GREENING	R.N.V.R.
E. T. STREETS	LONDON REGT.

The tablet was placed in position shortly before Armistice Day, November 11th, 1932, and on that day it was unveiled

by Lt.-Col. E. Gold, D.S.O., Commandant of the Meteorological Section of the Royal Engineers in France during the war. Before unveiling the Tablet, Col. Gold said:—

"This day is naturally a day of great joy—solemn joy—for all who experienced the great strain of the years 1914-1918: and to-day we have met in this library to commemorate especially the sacrifice which four men of the Meteorological Office made. It is right and fitting that we should: the world can never forget what they did. Life is a precious thing to men, but to none is it more precious than to the young—to the men who have just reached the age when they feel the freedom and the power of manhood. These men whom we commemorate to-day were such young men:—

N. C. Bradnock, killed near Ypres, May, 1915, Age 20.
G. J. Barker, killed by a shell in France, October, 1916, Age 19.
W. B. Greening, killed in a night attack at the Dardanelles, May, 1915, Age 18.
E. T. Streets, killed April, 1917, Age 20.

One of them, when I heard in France that he was in the Army—I asked for his transfer to the Meteorological Section—but it was too late—already he had fought and died. Perhaps, though we thought not, it was better so. You remember Socrates' words after his trial: 'whether life or death is better is known to God and to God only.'

"If we reflect, we may find many reasons for their death; they died for the establishment of right and justice among men, and we may gladly remember how much has already been achieved, without minimising how much there is still to do—there will always be to do—no generation can keep peace by the efforts of the past.

"And now, if I can trust myself, I should like to read you some lines in which Homer describes how the Gods desire us to deal with the heroic dead. Jove speaks to Apollo:—

'From amid the spears
Withdraw Sarpedon, and from all his wounds
Cleanse the dark gore; then bear him far away,
And lave his body in the flowing stream;
Then with divine ambrosia all his limbs
Anointing, clothe him in immortal robes.
To two swift bearers give him then in charge,
To Sleep and Death, twin brothers, in their arms
To bear him safe to Lycia's wide-spread plains:
There shall his brethren and his friends perform
His fun'ral rites, and mound and column raise,
The fitting tribute to the mighty dead.'

"I unveil now this Tablet, a memorial to the four men whose names are inscribed upon it."

Discussions at the Meteorological Office

The subjects for discussion for the next two meetings are :—

November 28th, 1932.—*Solar radiation as a meteorological factor.* By H. H. Kimball (Washington D.C., U.S. Dept. Agric., Mon. Weath. Rev., 59, 1931, pp. 472-9). *Opener*—Mr. H. Garnett, M.Sc.

December 12th, 1932.—*On the geographical distribution of fog in Sweden.* By E. Lindskog (Geogr. Ann., Stockholm, 13, 1931, pp. 1-94). *Opener*—Mr. N. H. Smith, B.Sc.

Correspondence

To the Editor, *The Meteorological Magazine.*

The Colour of Moonlight

Walking down Cockspur Street recently I saw in the window of one of the steamship agencies what purported to be a photograph of a steamer taken in moonlight, but which in reality was an ordinary photograph taken in daylight, but printed on a blue photographic paper. This method of obtaining a moonlight effect is well known : but for some reason this particular picture made me consider why moonlight is associated with blue. So far as I know, there is no physical reason : moonlight is only reflected sunlight and I do not see why the moon's surface should reflect more in the blue than in the other regions of the spectrum ; and no change takes place in the selective absorption of the atmosphere at sundown. I pondered whether the effect was not a convention which does not agree with reality and decided to examine the effect on some suitable night with bright moonlight.

On opening *The Times* the next morning I saw the following letter from Mr. L. C. W. Bonacina :—

" Blue Sky in Moonlight.—Although the night sky, when lit by the full moon after twilight has ended, is usually without colour, it is occasionally conspicuously blue, cases generally occurring with a strong west wind from the Atlantic. On the late evening of Monday, October 17th, an exquisite tint of blue sky, white banks of rippled cloud with a pearly lustre drifting at intervals across the nearly full moon, and a soft, yet invigorating, westerly wind charged with rich autumnal scents, combined to give a night of rare atmospheric beauty in the neighbourhood of London."

This seems to leave no doubt that moonlight scenes do sometimes appear blue. Can anyone say why?

G. C. Simpson.

October 24th, 1932.

Unusual Cloud Formation

With reference to the " Unusual Cloud Formation " described by T. F. Prosser in the September number of this magazine (p. 185), I would suggest that the clouds may be of the " horse-shoe " type obtained in 1928 in the Imperial College in vertically unstable liquids with a uniform slow shear and recently also in air.

From the form of the cloud our air experiments would indicate that the direction of motion is towards the left-hand bottom corner of the diagrams, and as the picture is towards the south this would probably mean that the motion was roughly towards the south-eastern horizon. On the few occasions when I have seen such clouds there have been many of them, and they have been more circular in form; but unless they are near the zenith perspective would elongate them.

G. T. WALKER.

Imperial College of Science, London, S.W.7. October 12th, 1932.

Supplementary Tangent Arcs to the 22° Halo

With reference to the extraordinary tangent arcs to the 22° halo seen on May 10th, 1932, at Padstow, I agree entirely with the opinion expressed by Miss Cicely M. Botley in the October number of the *Meteorological Magazine*.

These arcs cannot be Parry arcs. Yet I do not see why they should be called Kalmar arcs, since well before Kalmar, the observer at Ben Nevis observed the upper arc. Moreover, he was not the first. In the Memoir on halos by Bravais (*Journal de l'école royale polytechnique*, 31è cahier, Paris, 1847) there are given two previous observations of this arc: the one of April 22nd, 1846, by Coulvier (Pl. IV, fig. 148) is remarkably like that seen at Padstow; the other, of March 27th, 1826, by Hansteen (Pl. IV, fig. 140) is no less similar to that seen at Ben Nevis.

Bravais has suggested two explanations of these arcs. According to conditions they would be a reflexion phenomenon produced by the brilliant summit of the halo as the parhelic circle is produced by the sun, or else they would be due to refraction in prisms made by a vertical face and an oblique one sloped at a suitable angle.

These explanations do not seem satisfactory to me. They lack generality even if only the upper and lower tangent arcs are considered. Now, on different occasions other arcs tangent to the 45° halo have been seen on about the horizontal or again laterally at the height of the illuminating body.

The impression obtained is that this is a question of connected phenomena due to a similar method of dispersion of light, but

it appears difficult to imagine such an example bringing in only the forms of ice crystals actually observed.

L. BESSON.

Solar Phenomena

On October 10th I observed the following phenomena at 12h. 30m. G.M.T. The phenomena consisted of the upper portion of the 22° halo, with the upper contact arc curved downwards. The junction of the two arcs was bright. A parhelion occurred on either side of the sun, that on the right having a portion of the parhelic circle extending from it. The most interesting feature, however, was a short straight band of coloured light at the lower right-hand portion of the system and situated a few degrees outside the 22° halo. There were only two colours discernable which were very distinct, namely, red and green, the red being inside or towards the sun. Probably it was a portion of the lower arc of contact corresponding with the upper circumscribed arc. The upper portion of the 22° halo was observed at intervals during most of the morning. Weather conditions were unsettled with cumulo-nimbus and anvil cirrus round the southern horizon. The above phenomena were observed in bands of cirrus and cirro-stratus extending from small broken anvil-shaped clouds in the south-west. Rain appeared to be falling from the base of the anvils out to sea during most of the morning, while distant thunder and lightning occurred in the same direction, viz., from the south-east to the south-west, early (12h. to 2h.) when well developed anvils of "false cirrus" were visible on the horizon.

A. E. MOON.

39, *Clive Avenue, Clive Vale, Hastings. October 11th*, 1932.

A Series of Rainbows

As a result of the rapid succession of storm and sunshine, rainbows were seen here on at least seven occasions between 7 a.m. and 4.30 p.m. on October 13th. I myself saw the rainbows on five of these occasions. I cannot recall witnessing such a series previously, say, since 1862. The rainfall here was 0.84in. on the 13th, but the full inch was measured in the village which is within $\frac{2}{3}$ mile.

J. EDMUND CLARK.

Portway, Street, Somerset. November 1st, 1932.

NOTES AND QUERIES

The New International Weather Chart of the Northern Hemisphere

One of the aims of the Second International Polar Year is the detailed synoptic study of the atmospheric circulation over as large an area as possible. To aid in this research, the Deutsche Seewarte, Hamburg, undertook, on behalf of the International

Meteorological Organisation, to prepare a series of daily weather charts of the whole of the northern hemisphere. The preparatory work on these charts began at the end of 1930 and has been so successful that their production in time for discussion with the results of the Polar Year 1932-3 is fully assured, provided the necessary funds are forthcoming.

Two basic charts were prepared, a large chart on a scale of 1 to 30 million, in two colours, with a network of co-ordinates for every degree of latitude and longitude, showing also the river systems and the contour lines, and a smaller chart in one colour on a scale of 1 to 60 million. A number of sample weather charts were drawn for March, 1931, using different methods of representation, from which useful experience was gained in the collection of the data and the cost of preparation. The most suitable hour of observation was found to be about Greenwich noon, and the various Meteorological Services are supplying the corrected data for a selection of their stations in code form on manuscript sheets.

Up-to-date daily weather charts covering a large part of the northern hemisphere are no novelty, the first series having been made by the U.S. Weather Bureau at Washington as early as 1914, and similar charts made possible by the extensive organisation of reports by wireless telegraphy have been regularly issued for some time, by the Meteorological Office, London, and the Deutsche Seewarte, Hamburg. These up-to-date charts unavoidably show large blank areas, especially in low latitudes, but these blanks will be avoided in the new series, which will be based on far more complete series of data. In particular, the ocean areas will be represented to an extent not possible in the existing charts. Thanks to the willingness shown by all countries to co-operate, it should be possible to publish daily charts containing observations from about 1,000 land stations and 500 ships, all with a large number of weather elements.

Specimen charts for the first seven days of March, 1931, have already been published, and are of great interest. The charts for March 1st-4th and 6th give the isobars at intervals of 5mb., and also, for each station, the total cloudiness, wind direction and force, air temperature (for ships also sea temperature) and weather. The chart for March 5th gives isobars at intervals of 10mb., and in addition to the above details, the types of different clouds, the barometer reading, and at land stations the nature and amount of the barometric change in the preceding three hours. The chart for March 7th gives even more information along the lines of the Norwegian scheme of symbols. The specimens are completed by four charts on the half-scale maps. The final choice will be made according to the preferences shown by the recipients of the sample charts, but the publication of the series for the whole period of the Polar Year, from

August 1st, 1932, to August 31st, 1933, depends on the possibility of raising the necessary funds. The cost of publication must be covered by the sale of the charts, and the price of each set depends on the number of subscribers. With 400 subscribers the cost of the complete series of large charts giving full detail, similar to the specimen chart for March 7th, would be 171 RM., including portfolios. The cost of the simpler charts would be proportionately less, ranging down to 56 RM. for a complete series of small scale charts giving data for a limited number of stations. In order to obtain an idea of the number of purchasers, it is important that those meteorologists who are interested should indicate their readiness to subscribe. The assurance that the scheme will not have to be abandoned on the ground of cost will encourage Meteorological Services in undertaking the heavy task of condensing and coding the observations from a number of stations. The Deutsche Seewarte, Hamburg, will gladly send sample weather charts and price lists to those interested. Should the enterprise attain sufficient measure of success, it is hoped to continue the preparation of the charts after the end of the Polar Year, and a long series of daily charts of this degree of completeness will form an invaluable basis for many important researches.

Meteorological Station established at Bermuda

On August 5th, 1932, His Excellency the Governor, Lieut.-General Sir T. Astley-Cubitt, K.C.B., C.M.G., D.S.O., officially opened the new station, stating that it cannot fail to be classed as one of the most important meteorological centres of the British Empire, and that it had been established at considerable cost to the Colony for the benefit, not only of Bermuda, but also of the whole world.

The station is situated at Fort George on the crest of a hill 150 feet above sea level, and has a free exposure on all sides. The top of the fort provides an excellent position for taking pilot balloon observations, the first floor provides four offices and there is ample space on the second floor for storage of records.

It is principally due to the kind co-operation of the Meteorological Services of Great Britain, Canada and the United States that this office has been able to commence work so quickly, and it is now in a position to issue daily forecasts as well as broadcast warnings of tropical disturbances in the vicinity dangerous to shipping.

A meteorological station was established at St. George's, Bermuda, as early as January, 1866, the observations being made by the Army Medical Department. In December, 1869, the Medical Department was transferred to Hamilton and observations recommenced at the latter station in April, 1870. In

1901 the name of the Station was changed to Prospect, but there was no change of site until the opening of the new station.

Unification of the Meteorological Services of Portugal

A decree of the Ministry of Public Instruction and Fine Arts in Lisbon unifies the meteorological services of Portugal under the Central Meteorological Observatory annexed to the Faculty of Sciences of Lisbon with the collaboration of the other existing Meteorological Services and Observatories in Portugal, the Azores and Madeira. A national system of climatological stations is constituted, to make observations with standardised instruments according to a uniform plan. The principal hours of observation will be 9h. and 15h., but autographic instruments will be installed at as many stations as possible.

"Rain in Places"

The Meteorological Office was asked recently to furnish an answer to the following question: "On what percentage of days throughout the year does rain fall to the amount of 1mm. or more somewhere in the British Isles?" The question could not be answered from published statistics, which relate only to the frequency of such days at individual stations. Days with a fall of 1mm. (.04 inch) or more are referred to in *British Rainfall* as "wet days" and their average percentage frequency varies from about 30 at dry inland stations to 50 or more at wet stations in Scotland and Ireland. Knowing that it is rare for the weather to be rainless for 24 hours over the whole of the British Isles simultaneously, we should naturally expect the frequency of days which are "wet days" somewhere or other within the area to exceed by a large margin the frequency of "wet days" at any individual station.

In order to furnish an approximate answer to the question, a year, 1925, was selected in which the frequency of wet days was nearly normal in each of the main divisions of the British Isles and it was decided to confine attention to the 43 well-distributed stations for which daily readings of rainfall for the period of 24 hours ending at 7h. G.M.T. are given in the *Daily Weather Report, British Section*. The reports for the whole year were examined and it was found that on all but 12 days a rainfall of 1mm. or above occurred at one or more of the stations. Two of the days occurred in March, one in April, seven in June and two in November. The June of 1925 was exceptionally dry and this fact may have affected the total frequency of "non-wet" days for the year. Also some of the days on which no reading of 1mm. occurred would probably have disappeared from the list had the records of additional stations in wet areas been examined.

Taking the figures as they stand, however, it appears that about 97 per cent. of all days yield a rainfall of at least a millimetre somewhere within the confines of the British Isles.

In a note on "The Daily Fall of Rain over the British Isles" in the *Quarterly Journal of the Royal Meteorological Society*, 1927, pp. 65-7, Dr. J. Glasspoole gives data which are of interest in this connexion. Taking a hundred well-distributed stations he found that in the wet year 1923 there was not a single day without rain at one station at least, and there were only four days without rain at fewer than five stations.

E. G. BILHAM.

Dust Haze at Wei Hai Wei

A report has recently been received from Flight-Lieut. R. M. Trevethan, M.C., R.A.F., of an unusually intense dust haze at Wei Hai Wei on May 19th, 1932.

During the morning there was a gusty south-westerly wind of force 4 at sea level with a visibility of 4 to 5 miles away from the sun and $\frac{3}{4}$ to 1 mile into the sun. In the evening there was a calm and the visibility decreased as the wind dropped. During an aeroplane ascent in a cloudless sky at 11h. 15m. local time, the temperature rose from 70°F. at the ground to 73°F. at 2,000 feet, while there was a lapse rate exceeding the dry adiabatic from 4,000 to 8,000 feet. The visibility at 8,000 feet was similar to that at ground level and the haze thinner, while it was estimated the haze top was about 10,000 feet. The weather maps for May 19th disclosed a low-pressure area extending from east Mongolia southwards to the province of Anhwei, with the lowest pressure near to and north-east of Pekin. Other shallow depressions were shown east of Shanghai and near eastern Korea. Pressure was relatively high towards the Burmese borderlands. This pressure distribution gave rise to an average air movement from north-west to west near Wei Hai Wei and the air mass most probably originated over Inner Mongolia and the Gobi Desert. The dust deposit was so thick that sweepings were made from the wings of the seaplane, which was on deck after the ascent. The dust was dark brown in colour and the particles extremely small.

Lieut. J. P. Wright, R.N., in a report, dated October 26th, 1929, states that dust haze extends to considerable heights and occasionally to 10,000 feet over land areas near the south China coast during nearly the whole of the north-east monsoon and occasionally at other times. It is especially thick when the sky is cloudless and turbulence over the land assists. In north China it is fairly common in fine weather, but it is less regular in its occurrence; it does not extend to such high levels, and the horizon above the haze is not so clear cut. The

clear-cut horizon is always accompanied by a temperature inversion or a noticeable temporary decrease of lapse rate.

Lieut.-Com. Doddington, R.N., in commenting on Lieut. Wright's report, considers that during the north-east monsoon the haze top marks the boundary of the monsoon wind and the counter westerly wind above. The haze is more pronounced near the land, but it probably exists well out to sea. During the southerly monsoon in summer there is no sharp-cut haze horizon and no sharp dividing line between the surface air currents and those above.

The measurements referred to in the early part of this report were taken during the early part of the summer monsoon when SE. winds prevail over east China near the Yangtze, and the decrease in haze at the top of the ascent and its probable termination at 10,000 feet bear out the views expressed in the preceding paragraph.

R. S. READ.

Reviews

Acta Phænologica, Vol. 1, Parts 1-6. Edited by the Board of the Phenological Association of the Netherlands, Secretary, Dr. H. Bos. Size 10 × 6½in., pp. 200 + xii. The Hague, 1931-2. Price 6 guilders for 6 parts.

With the first volume now complete before him the reader is able to form some estimate of the value of the first international phenological journal to be published. Both Dr. Bos of Wageningen, and the Phenological Association of the Netherlands are to be congratulated on the result of their enterprise. Over twenty articles on various phenological subjects contributed from five countries, together with sundry notes and summaries, make up an impressive table of contents for the first volume, and should be encouraging to all concerned. Dr. Hugh Robert Mill once described phenology as "a rather woolly subject," and this "woolliness" is not reduced by the language difficulty, which here is somewhat obtrusive, and, in these Islands at any rate, may tend to make the journal less popular than it deserves to be. This difficulty is anticipated and commented on in the last number in the Volume and would seem to be inherent in the nature of an international journal and scarcely avoidable. With regard to phenology itself, a noteworthy suggestion to reduce the "woolliness" is contained in a paper by Professor S. Illichevsky (p. 177) who proposes a numerical and symbolical method of recording observations which would make for greatly increased precision in the notes with which tabulators have to deal. These would therefore become increasingly valuable, and in process of time would give an accurate view of the effect on wild nature of the march of the seasons, modified by

meteorological vagaries, far beyond anything at present available—possibly on a world-wide scale. It is impossible in the limited space at our disposal to give due appreciation to the interesting articles by Dr. Bos, Dr. Ihne and other contributors; those interested are recommended to explore these pages for themselves. The publication of the sixth number, completing Vol. 1, coincides with the 75th birthday of Dr. Bos and forms in itself a fitting testimonial to a distinguished career, which it may be hoped is by no means finished. The President of the Phenological Association of the Netherlands, in his note on p. 161, draws attention to the venerable ages of the leading phenologists, viz., Dr. Ihne 73, Dr. Bos 75, and Mr. J. E. Clark 81. Truly these three gentlemen are to be congratulated on having lived to see their science, always important, at long last universally recognized and organized on international lines.

R. MARSHALL.

Die Verwendungsmöglichkeit der Relationen zwischen Trübungsfaktoren und Luftkörpern für die praktische Wetteranalyse. By W. Grundmann and O. Moese. (Reprint from Ann. Hydr. Berlin 59, 1931, pp. 254-61.)

From the examination of observations of solar radiation made in June, 1930, it is shown that these observations are of help in identifying air masses. The absorption of radiation by the atmosphere is larger in tropical air than in polar air, owing to its greater water content. In interpreting the data, allowance must be made for local factors such as town smoke.

C. K. M. DOUGLAS.

Obituary

Father Louis Froc, S.J.—We regret to learn of the death in October in Paris of Father Froc, Director of Zi-ka-wei Observatory, Shanghai, from 1896 to 1931. Father Froc was born in Brest in 1859. He entered the Society of Jesus at the age of 16 and studied for the priesthood. In 1883, though not yet a priest, he went to take up work with the Kiangnan Mission at Zi-ka-wei, then a small meteorological observatory. In 1896 he became the Director of this observatory and devoted himself to the study of typhoons to the great benefit of the world's shipping. He organised the system of daily weather reports and typhoon warnings issued by the observatory, and when he retired, the observatory was one of the most important ones in the East. A short account of his works is given in the *Meteorological Magazine* for March, 1932, p. 41.

Father Ricardo Cirera, S.J.—We regret to learn of the death on November 3rd of Father R. Cirera, founder and Director of the Observatory of the Ebro. Father Cirera was born in 1864 and first showed his scientific abilities in the magnetic section of

Manila Observatory, afterwards studying in the great observatories of Europe and America. In 1904 he realised his life's ambition of establishing a geophysical observatory in Spain, the well-known Observatorio del Ebro, Tortosa, of which he became the first Director, retiring in 1919.

News in Brief

Dr. G. C. Simpson, C.B., F.R.S., Director of the Meteorological Office, has been elected a corresponding member of the State Russian Geographical Society.

Father J. de Moidrey, S.J., retired from the directorship of the magnetic section of the Zi-ka-wei Observatory in April, 1932. He is succeeded by Father M. Burgaud, S.J. Father de Moidrey during the last fourteen years published a number of studies dealing with different aspects of terrestrial magnetism based chiefly on the work of the magnetic observatory at Lu-kia-pang.

The Weather of October, 1932

Pressure was below normal over Europe (except the Iberian Peninsula), Iceland, Spitsbergen, northern Alaska, eastern Canada, eastern and south-western United States, the greatest deficit being 11.3mb. at Blaavands Huk. In Scania, Sweden, it was 9.5mb. below normal, the greatest deficit recorded there in October for at least 70 years. Pressure was above normal over the North Atlantic, southern Greenland, western Canada and north-western United States, the greatest excesses being 6.7mb. at Horta and 4.1mb. at 60°N. 110°W. Temperature was below normal generally in northern and south-west Europe but above normal in central Europe and Spitsbergen. Precipitation was deficient in Spitsbergen and central Europe. In Sweden, it was only 40 per cent. of the normal in western Lapland, increasing to 115 per cent. in eastern Norrland, to 140 per cent. in Dalecarlia and to twice the normal in south-eastern Gothaland.

Unsettled wet weather prevailed during most of October over the British Isles, though much sunshine occurred early in the month in the south and Midlands. On the 1st there was a gradual drop of temperature as northerly winds penetrated southwards in the rear of a depression which was moving away eastwards. This was followed by an anticyclone spreading across from the North Atlantic to central Europe. Fine sunny cool weather prevailed generally during the next few days except after the 3rd in north Scotland; 10.0hrs. bright sunshine were reported from Clacton, Dover, Portsmouth and Southsea on the 4th and ground frosts occurred in many places; 18°F. and 19°F.

were recorded at Renfrew and Rhayader respectively on the 4th. Snow was reported on the hills above Fort Augustus on the 5th. By the 6th a deep depression centred south-east of Iceland was spreading south-east, temperature was rising considerably and rain falling generally in the north-west. From the 7th to the 17th a complex area of low pressure lay over the British Isles, rain occurred on most days, the heaviest falls being on the 7th and 11th, 2.71in. were recorded at Trecastle (Brecon) and 2.08in. at Holne (Devon) on the 7th, and 3.05in. at Pembroke on the 11th. The 9th was the sunniest day of the period in Scotland and the 10th in England and Ireland, with 9.0hrs. bright sunshine at Inchkeith on the 9th and 9.8hrs. at Plymouth and 9.5hrs. at Ballinacurra on the 10th. Thunderstorms occurred in south-east England on the 11th and in the Midlands on the 13th while strong winds and gales were experienced at the mouth of the English Channel and in north Scotland and north Ireland on the 7th and 8th and locally in the north on the 14th. After the strong north-westerly gales early in the morning of the 18th had subsided a wedge of high pressure passed across the country, giving a sunny period with 9.3hrs. sunshine at Dover and 9.1hrs. at Bradford, Folkestone and Hastings on the 18th. From then to the end of the month a series of depressions moved across the country, sometimes north-eastwards, sometimes south-eastwards. Weather was generally unsettled with heavy rain at times but some bright intervals, 3.18in. of rain were measured at Snowdon (Carnarvon) and 3.07in. at Trecastle (Brecon) on the 21st. The 28th was the sunniest day of the period, with 9.0hrs. at Torquay and Bognor, 8.6hrs. at Ballinacurra and 8.4hrs. at Dumfries. Temperature was low in Scotland during this time and also in England on the 28th and 29th. The maximum temperature at Marchmont and Durham on the 29th was only 37°F., while a screen minimum of 24°F. was recorded at Renfrew and minima on the ground of 16°F. at Renfrew and 17°F. at Rhayader and Dalwhinnie. Snow showers were reported from Aberdeen on the 28th and snow fell locally in Scotland on the 29th. Thunderstorms occurred locally in Ireland on the 22nd and 27th while gales were experienced at the month of the English Channel on the 22nd, 23rd and 27th and on the western seaboard on the 29th, 30th. The distribution of bright sunshine for the month was as follows:—

	Total (hrs.)	Diff. from normal (hrs.)		Total (hrs.)	Diff. from normal (hrs.)
Stornoway	56	−30	Liverpool	81	− 5
Aberdeen	81	−14	Ross-on-Wye	108	+16
Dublin	126	+22	Falmouth	121	+ 5
Birr Castle	113	+15	Gorleston	71	−38
Valentia	80	−21	Kew	97	+ 5

Miscellaneous notes on weather abroad culled from various sources.

A small hurricane swept over the village of Landenbach (north Würtemberg) on the night of the 13th. It lasted only a few minutes but did much material damage; no one was hurt. Snow fell on the 28th in Switzerland down to the level of 3,500ft; further abundant snowfalls occurred on the following days, the snow on the 30th being down to the 1,000ft. level. The Alpine passes were blocked by the 31st. Torrential rains during the last few days of the month caused floods in Belgium. The Senne overflowed at Forest (a suburb of Brussels) and the Meuse broke its banks between Namur and Dinant. During the last days of the month also gales were experienced along the Atlantic and English Channel seaboards of France and heavy rain or snow, inland in most districts of France; many rivers were in varying degrees of flood. (*The Times*, October 15th-November 1st.)

A severe thunderstorm which occurred in Palestine on the 5th caused much damage in Rishon-le-Zion and Tel Aviv. (*The Times*, October 7th.)

Much damage was done by a cyclone in the Warworth district of North Auckland (New Zealand) on the 26th. Thunderstorms occurred locally in Queensland during the last days of the month. (*The Times*, October 28th-November 3rd.)

A blizzard was experienced in northern Ontario on the 8th. A cloudburst occurred near Tehachapi Cañon (California) on the 1st; 80 people were drowned in the cañon and 13 other people given up as lost. Much damage was done at Tehachapi, Woodford, Caliente, and other small towns near by in the mountains. Violent storms occurred in the region of Rio de Janeiro about the 5th. Temperature was below normal generally during the first half of the month but later a warm spell passed across the country from west to east. The greatest change took place in the Missouri Valley. Rapid City (South Dakota) and North Platte (Nebraska) were respectively 15°F. and 7°F. below normal for the week ending the 11th, 3°F. and 10°F. above normal for the week ending the 18th and 8°F. and 4°F. below normal for the weeking ending the 25th. Rainfall was mainly about normal except during the middle of the month in the Atlantic coastal regions and the eastern Gulf States. Greenville (South Carolina) had as much as 7.1in. above the normal for the week ending the 18th. (*The Times*, October 3rd-13th and *Washington D.C., U.S. Dept. Agric. Weekly Weather and Crop Bulletin.*)

Rainfall, October, 1932—General Distribution

England and Wales	153	per cent of the average 1881-1915.
Scotland	169	
Ireland	105	
British Isles	148	

Rainfall: October, 1932: England and Wales.

Co.	Station	In.	Per-cent. of Av.	Co.	Station	In.	Per-cent. of Av.
Lond.	Camden Square	5·25	199	*Leics.*	Belvoir Castle.....	3·02	112
Sur.	Reigate, Alvington ...	6·82	205	*Rut.*	Ridlington	3·32	118
Kent.	Tenterden, Ashenden...	7·32	209	*Lincs.*	Boston, Skirbeck	3·36	123
,, .	Folkestone, Boro. San.	8·89	...	,, .	Cranwell Aerodrome ...	3·13	109
,, .	Margate, Cliftonville...	5·10	175	,, .	Skegness, Marine Gdns	2·71	99
,, .	Sevenoaks, Speldhurst	5·91	...	,, .	Louth, Westgate	3·68	114
Sus.	Patching Farm	7·56	191	,, .	Brigg, Wrawby St. ...	2·94	...
,, .	Brighton, Old Steyne..	6·34	164	*Notts.*	Worksop, Hodsock ...	3·08	117
,, .	Heathfield, Barklye ...	8·91	215	*Derby.*	Derby, L. M. & S. Rly.	2·82	108
Hants.	Ventnor, Roy. Nat. Hos.	7·55	192	,, .	Buxton, Devon Hos. ...	8·00	163
,, .	Fordingbridge, Oaklnds	5·35	129	*Ches.*	Runcorn, Weston Pt...	6·26	182
,, .	Ovington Rectory	5·96	147	,, .	Nantwich, Dorfold Hall	5·47	...
,, .	Sherborne St. John ...	4·11	117	*Lancs.*	Manchester, Whit Pk.	6·78	205
Berks.	Wellington College ...	4·45	136	,, .	Stonyhurst College ...	7·91	176
,, .	Newbury, Greenham...	4·54	129	,, .	Southport, Hesketh Pk	7·15	202
Herts.	Welwyn Garden City...	4·12	...	,, .	Lancaster, Strathspey	5·98	...
Bucks.	H. Wycombe, Flackwell	4·76	...	*Yorks.*	Wath-upon-Dearne ...	3·26	118
Oxf.	Oxford, Mag. College...	4·43	159	,, .	Bradford, Lister Pk. ...	4·35	125
Nor.	Pitsford, Sedgebrook...	3·07	114	,, .	Oughtershaw Hall	9·22	...
,, .	Oundle.....	2·76	...	,, .	Wetherby, Ribston H.	3·24	108
Beds.	Woburn, Crawley Mill	3·43	128	,, .	Hull, Pearson Park ...	2·91	98
Cam.	Cambridge, Bot. Gdns.	3·41	144	,, .	Holme-on-Spalding ...	3·35	...
Essex.	Chelmsford, County Lab	4·90	200	,, .	West Witton, Ivy Ho.	4·26	115
,, .	Lexden Hill House ...	4·96	...	,, .	Felixkirk, Mt. St. John	3·55	123
Suff.	Haughley House.....	3·79	...	,, .	Pickering, Hungate ...	3·85	126
,, .	Campsea Ashe.....	4·78	183	,, .	Scarborough	3·10	99
Norf.	Norwich, Eaton.....	...	...	,, .	Middlesbrough	2·91	100
,, .	Wells, Holkham Hall	4·21	150	,, .	Balderdale, Hury Res.	5·29	...
,, .	Swaffham, The Villa...	5·68	192	*Durh.*	Ushaw College	4·63	134
Wilts.	Devizes, Highclere.....	5·10	164	*Nor.*	Newcastle, Town Moor	3·50	109
,, .	Bishops Cannings	5·51	166	,, .	Bellingham, Highgreen	4·79	122
Dor.	Evershot, Melbury Ho.	8·17	177	,, .	Lilburn Tower Gdns...	5·42	146
,, .	Creech Grange	6·64	131	*Cumb.*	Geltsdale.....	5·81	...
,, .	Shaftesbury, Abbey Ho.	5·76	148	,, .	Carlisle, Scaleby Hall	5·37	161
Devon.	Plymouth, The Hoe...	7·82	198	,, .	Borrowdale, Seathwaite	19·00	167
,, .	Launceston, Werringt'n	10·94	...	,, .	Borrowdale, Moraine...	16·40	...
,, .	Holne, Church Pk. Cott.	13·29	201	,, .	Keswick, High Hill...	8·43	...
,, .	Cullompton.....	7·48	181	*West.*	Appleby, Castle Bank	5·86	168
,, .	Sidmouth, Sidmount...	6·51	175	*Glam.*	Cardiff, Ely P. Stn. ...	6·64	138
,, .	Filleigh, Castle Hill ...	9·99	...	,, .	Treherbert, Tynywaun	15·72	...
,, .	Barnstaple, N. Dev. Ath	9·25	202	*Carm.*	Carmarthen Friary ...	9·17	160
,, .	Dartm'r, Cranmere Pool	16·70	...	*Pemb.*	Haverfordwest, School	8·07	149
Corn.	Redruth, Trewirgie ...	8·96	171	*Card.*	Aberystwyth	7·67	...
,, .	Penzance, Morrab Gdn.	9·10	195	,, .	Cardigan, County Sch.	7·07	...
,, .	St. Austell, Trevarna...	10·03	190	*Brec.*	Crickhowell, Talymaes	8·50	...
Soms.	Chewton Mendip	8·16	169	*Rad.*	Birm W.W. Tyrmynydd	10·33	156
,, .	Long Ashton	7·48	198	*Mont.*	Lake Vyrnwy.....	9·27	163
,, .	Street, Millfield.....	5·82	178	*Denb.*	Llangynhafal	5·37	142
Glos.	Blockley	4·20	...	*Mer.*	Dolgelly, Bryntirion...	11·00	181
,, .	Cirencester, Gwynfa ...	5·22	158	*Carn.*	Llandudno	3·72	104
Here.	Ross, Birchlea.....	5·37	163	,, .	Snowdon, L. Llydaw 9	24·45	...
,, .	Ledbury, Underdown..	4·41	143	*Ang.*	Holyhead, Salt Island	5·24	131
Salop.	Church Stretton.....	5·80	160	,, .	Lligwy.....	6·46	...
,, .	Shifnal, Hatton Grange	4·45	157	*Isle of Man*			
Worc.	Ombersley, Holt Lock	3·57	134		Douglas, Boro' Cem. ...	8·50	184
War.	Birmingham, Edgbaston	3·55	128	*Guernsey*			
Leics.	Thornton Reservoir ...	4·01	143		St. Peter P't. Grange Rd	6·34	141

Rainfall: October, 1932: Scotland and Ireland.

Co.	Station	In.	Per-cent. of Av.	Co.	Station	In.	Per-cent. of Av.
Wigt.	Pt. William, Monreith	5·91	149	*Suth.*	Melvich	4·76	...
,,	New Luce School	7·04	151	,,	Loch More, Achfary	8·32	107
Kirk.	Carsphairn, Shiel	11·04	155	*Caith.*	Wick	4·93	166
Dumf.	Dumfries, Crichton, R.I	6·02	162	*Ork.*	Pomona, Deerness	4·56	120
,,	Eskdalemuir Obs.	9·18	170	*Shet.*	Lerwick	3·38	86
Roxb.	Branxholm	5·40	166	*Cork.*	Caheragh Rectory	5·52	...
Selk.	Ettrick Manse	7·89	143	,,	Dunmanway Rectory	5·91	98
Peeb.	West Linton	6·31	...	,,	Ballinacurra	4·28	105
Berw.	Marchmont House	6·05	158	,,	Glanmire, Lota Lo.	4·04	97
E.Lot.	North Berwick Res.	5·36	181	*Kerry.*	Valentia Obsy.	5·19	93
Midl.	Edinburgh, Roy. Obs.	5·81	212	,,	Gearahameen	8·40	...
Lan.	Auchtyfardle	5·40	...	,,	Killarney Asylum	4·53	84
Ayr.	Kilmarnock, Kay Pk.	6·00	...	,,	Darrynane Abbey	4·91	98
,,	Girvan, Pinmore	7·67	153	*Wat.*	Waterford, Gortmore	5·03	128
Renf.	Glasgow, Queen's Pk.	6·49	199	*Tip.*	Nenagh, Cas. Lough	3·72	110
,,	Greenock, Prospect H.	7·45	138	,,	Roscrea, Timoney Park	3·32	...
Bute.	Rothesay, Ardencraig	9·10	...	,,	Cashel, Ballinamona	3·30	92
,,	Dougarie Lodge	6·76	...	*Lim.*	Foynes, Coolnanes	3·65	98
Arg.	Ardgour House	12·83	...	,,	Castleconnel Rec.	3·92	...
,,	Glen Etive	12·93	160	*Clare.*	Inagh, Mount Callan	6·42	...
,,	Oban	9·40	204	,,	Broadford, Hurdlest'n.	4·11	...
,,	Poltalloch	8·67	175	*Wexf.*	Gorey, Courtown Ho.	3·62	102
,,	Inveraray Castle	11·98	170	*Kilk.*	Kilkenny Castle	3·35	106
,,	Islay, Eallabus	7·40	155	*Wick.*	Rathnew, Clonmannon	3·45	...
,,	Mull, Benmore	...	...	*Carl.*	Hacketstown Rectory	3·35	88
,,	Tiree	5·13	113	*Leix.*	Blandsfort House	3·64	103
Kinr.	Loch Leven Sluice	5·97	174	,,	Mountmellick	4·90	...
Perth.	Loch Dhu	...	...	*Offaly.*	Birr Castle	3·30	113
,,	Balquhidder, Stronvar	6·29	...	*Kild'r.*	Monasterevin	3·96	...
,,	Crieff, Strathearn Hyd.	5·87	149	*Dublin*	Dublin, FitzWm. Sq.	2·36	88
,,	Blair Castle Gardens	6·62	213	,,	Balbriggan, Ardgillan	2·74	101
Angus.	Kettins School	6·26	198	*Meath.*	Beaupare, St. Cloud	3·29	...
,,	Dundee, E. Necropolis	6·48	243	,,	Kells, Headfort	3·67	110
,,	Pearsie House	6·24	...	*W.M.*	Moate, Coolatore	3·36	...
,,	Montrose, Sunnyside	6·83	247	,,	Mullingar, Belvedere	4·29	129
Aber.	Braemar, Bank	8·17	217	*Long.*	Castle Forbes Gdns.	3·76	115
,,	Logie Coldstone Sch.	7·76	239	*Gal.*	Ballynahinch Castle	4·46	75
,,	Aberdeen, King's Coll.	6·59	219	,,	Galway, Grammar Sch.	2·84	...
,,	Fyvie Castle	7·91	207	*Mayo.*	Mallaranny	5·87	...
Moray	Gordon Castle	6·54	207	,,	Westport House	4·10	91
,,	Grantown-on-Spey	...	...	,,	Delphi Lodge	6·74	71
Nairn.	Nairn	4·59	195	*Sligo.*	Markree Obsy.	5·37	132
Inv's.	Ben Alder Lodge	7·92	...	*Caran.*	Belturbet, Cloverhill	3·24	111
,,	Kingussie, The Birches	6·66	...	*Ferm.*	Enniskillen, Portora	3·56	...
,,	Loch Quoich, Loan	15·10	...	*Arm.*	Armagh Obsy.	2·82	104
,,	Glenquoich	16·72	167	*Down.*	Fofanny Reservoir	5·10	...
,,	Inverness, Culduthel R.	4·87	...	,,	Seaforde	3·77	106
,,	Arisaig, Faire-na-Squir	8·58	...	,,	Donaghadee, C. Stn.	3·12	108
,,	Fort William, Glasdrum	10·96	...	,,	Banbridge, Milltown	2·96	...
,,	Skye, Dunvegan	8·66	...	*Antr.*	Belfast, Cavehill Rd.	4·19	...
,,	Barra, Skallary	6·75	...	,,	Glenarm Castle	5·37	...
R & C.	Alness, Ardross Castle	5·94	154	,,	Ballymena, Harryville	4·81	130
,,	Ullapool	5·41	112	*Lon.*	Londonderry, Creggan	6·53	177
,,	Achnashellach	7·64	95	*Tyr.*	Omagh, Edenfel	4·03	110
,,	Stornoway	5·38	...	*Don.*	Malin Head	5·58	...
Suth.	Lairg	4·27	114	,,	Dunfanaghy	5·65	...
,,	Tongue	5·07	121	,,	Killybegs, Rockmount	5·95	106

Climatological Table for the British Empire, May, 1932

STATIONS	PRESSURE		TEMPERATURE							Relative Humidity	Mean Cloud Am'nt	PRECIPITATION			BRIGHT SUNSHINE	
			Absolute		Mean Values				Mean							
	Mean of Day M.S.L.	Diff. from Normal	Max.	Min.	Max.	Min.	½ max. and min.	Diff. from Normal	Wet Bulb			Am'nt	Diff. from Normal	Days	Hours per day	Percentage of possible
	mb.	mb.	°F.	°F.	°F.	°F.	°F.	°F	°F	%	0—10	in.	in.			
London, Kew Obsy.	1011·4	— 4·5	74	35	59·7	46·2	52·9	— 0·5	48·0	87	8·0	4·03	+ 2·31	18	3·7	24
Gibraltar	1017·0	+ 0·9	85	50	74·4	55·5	64·9	— 0·6	54·2	78	4·3	0·61	— 1·12	4	..	..
Malta	1016·4	+ 1·9	84	53	72·6	59·6	66·1	+ 0·2	60·0	72	4·2	0·02	— 0·39	2	11·1	79
St. Helena	1015·3	+ 1·1	69	57	65·5	59·4	62·5	— 0·6	60·2	94	8·8	6·37	..	19	..	..
Sierra Leone	1012·7	+ 1·5	91	71	86·3	74·6	80·5	— 1·0	76·4	83	7·5	7·62	— 3·85	25	..	..
Lagos, Nigeria	1011·7	+ 1·1	90	72	86·0	76·0	81·0	— 0·8	77·0	83	8·7	11·34	+ 0·59	14	5·5	44
Kaduna, Nigeria	1012·1	— 0·6	96	66	90·7	71·5	81·1	+ 1·7	73·7	73	7·2	2·92	— 2·78	12	7·6	60
Zomba, Nyasaland	1015·8	+ 0·7	82	50	74·0	55·6	64·8	— 1·0	..	81	5·6	0·58	— 0·46	7	..	..
Salisbury, Rhodesia	1020·5	+ 1·0	80	43	71·9	49·4	60·7	+ 0·1	54·0	63	3·7	0·39	— 0·09	3	7·1	63
Cape Town	1018·7	+ 0·6	99	43	72·2	53·9	63·1	+ 4·2	54·5	81	4·9	4·99	+ 1·24	16	..	..
Johannesburg	1021·8	+ 2·3	72	37	64·6	45·5	55·1	+ 0·7	45·7	54	2·5	0·54	— 0·22	3	9·0	83
Mauritius	1017·3	+ 0·9	82	58	77·9	65·3	71·6	— 1·0	68·0	72	5·1	5·80	+ 2·77	17	7·9	71
Calcutta, Alipore Obsy.	1003·2	— 0·3	104	70	94·8	79·3	87·1	+ 1·0	79·1	81	5·5	11·74	+ 6·18	7*	..	..
Bombay	1006·1	— 1·3	95	77	92·2	80·1	86·1	+ 0·3	78·3	75	4·5	0·57	+ 0·02	2*	..	..
Madras	1004·8	— 0·6	107	76	93·7	80·2	86·9	— 2·9	78·3	69	6·5	0·59	— 1·25	3*	..	..
Colombo, Ceylon	1008·6	+ 0·2	90	72	85·9	76·3	81·1	— 1·7	77·9	82	8·5	28·98	+ 18·04	25	4·4	35
Singapore	1008·6	— 0·1	92	72	87·5	74·9	81·2	— 0·8	77·5	81	6·7	11·41	+ 4·77	17	6·1	50
Hongkong	1009·0	— 0·1	89	75	85·8	78·0	81·9	+ 4·5	78·0	81	6·9	2·51	— 9·56	9	7·3	55
Sandakan	..	..	89	74	87·2	76·3	81·7	— 0·8	..	..	..	4·55	— 1·78	15	..	..
Sydney, N.S.W.	1024·5	+ 5·9	73	45	66·2	52·4	59·3	+ 0·5	54·7	85	7·1	2·18	— 3·00	16	4·6	44
Melbourne	1025·4	+ 6·2	70	39	61·6	48·0	54·8	+ 0·7	50·8	84	8·1	0·59	— 1·57	9	2·7	27
Adelaide	1023·0	+ 3·0	81	44	69·5	52·4	60·9	+ 3·0	54·0	64	5·6	2·39	— 0·39	9	5·1	50
Perth, W. Australia	1016·5	— 1·9	83	45	70·1	55·0	62·5	+ 1·8	56·1	71	5·5	8·22	+ 3·25	15	5·5	53
Coolgardie	1018·4	— 1·0	82	37	71·0	48·9	59·9	+ 2·2	52·9	68	4·3	0·79	— 0·54	7	..	..
Brisbane	1021·6	+ 3·0	77	53	72·3	57·8	65·1	+ 0·5	59·2	69	4·7	1·66	— 1·15	11	6·1	57
Hobart, Tasmania	1023·3	+ 8·0	68	34	59·4	44·1	51·7	+ 1·2	46·5	74	5·6	0·35	— 1·55	4	6·0	62
Wellington, N.Z.	1017·3	+ 1·7	63	36	55·2	45·1	50·1	— 2·7	47·5	81	5·8	7·79	+ 3·11	14	5·0	51
Suva, Fiji	1012·9	+ 0·2	89	72	84·0	73·8	78·9	+ 2·4	75·5	86	6·6	8·87	— 1·20	23	4·4	39
Apia, Samoa	1011·0	— 0·1	88	70	86·3	75·2	80·7	+ 2·3	77·1	76	4·8	3·80	— 2·27	16	8·1	70
Kingston, Jamaica	1011·9	— 1·2	91	68	87·2	72·0	79·6	— 0·1	72·1	79	4·5	2·91	— 1·48	12	5·9	45
Grenada, W.I.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Toronto	1017·0	+ 2·1	83	32	64·3	46·3	55·3	+ 1·5	48·4	69	6·4	3·19	+ 0·40	13	7·2	49
Winnipeg	1017·0	+ 3·2	92	25	67·5	42·3	54·9	+ 2·9	42·7	71	4·8	0·73	— 1·27	4	8·4	55
St. John, N.B.	1015·6	+ 1·7	66	32	56·4	41·1	48·7	+ 1·0	44·7	69	5·3	2·63	— 1·08	11	6·8	46
Victoria, B.C.	1018·6	+ 1·9	76	41	59·4	46·1	52·7	— 0·3	49·4	74	5·7	0·29	— 0·84	5	9·1	60

* For Indian stations a rain day is a day on which 0·1 in. or more rain has fallen.

Victoria, B.C.	1018·61	+ 1·9	76	41	59·4	46·1	52·7	— 0·3	49·4	74	5·7	0·29	— 0·84	5	9·1	60

* For Indian stations [illegible] day is a "[illegible]" in. or more rain has fallen.